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The Introduction of Female Labour

Eminent works managers have on more than one occasion confessed to us that they found it much easier to control a thousand men than ten women. This outlook is no doubt due to the fact that from their apprenticeship onwards they have been acquiring the requisite knowledge of labour organisation by personal contact with men and boys. A prerequisite for the control of women and girl labour, is that control is effected through a forewoman or chargehand, and no direct contact is made between the manager and the operative. Yet it should be realised that the managers of the great textile mills of Lancashire and Yorkshire find no more difficulty in the efficient control of female labour than of male. This is due to the fact that generations of factory life have brought about in all sections of the community an intensive knowledge of the general conditions of such employment. Hence if one could but staff a core shop with ex-Lancashire mill girls the life of the manager would not be too harassing. Present conditions, however, demand the utilisation of women, the majority of whom are totally unfamiliar with factory life. Many useful hints as to the overcoming of initial difficulties are to be found amongst the publications issued by the Ministry of Labour and National Service, but naturally they can only give generalisations, and the interpretation of these requires a consideration of the actual shop conditions and the mental make-up of the entrant. The newcomer, devoid of previous industrial contacts, is on entering the workshop for the first time most probably in a highly nervous condition, and needs to meet a person possessing the equivalent of a successful medical man's "bedside manner." Next, there should be a general conversation showing the girl the important nature of the work carried out at the factory, and how, once she settles down, absence and bad time-keeping will adversely affect her mates. This seems essential as it is not uncommon to find excuses for absence including "my cousin Mary asked me to go shopping with her" and "Jack wanted me to go to the pictures with him." Protracted holidays are excused by "I went to spend a week with my uncle in Wales." Such irresponsibility is due to lack of proper initiation into factory life, and is a reflection on the management, or at the least on the official whose duty it was to effect her introduction into the new conditions. The wise foundry manager will insist that the forewoman gives a report daily as to the progress made by each beginner, until one reads "Has settled down satisfactorily." Until this "all clear" signal is given special attention should be paid to the girl's home or lodging conditions, as these are probably of profound importance in ensuring reasonable happiness under strange conditions. Obviously personal attention to this by the forewoman, or in the case of the larger concerns, welfare supervisor, will do much to mitigate initial difficulties. The fundamental difference between the new entrant into industry and the established female factory hand, is that the latter choose it for a vocation, whilst the former has no such background, and consequently her case is psychologically quite a different one. The wages incentive might or might not make the same appeal. Restrictions will be infinitely more arduous, and not in every case will patriotism overcome inherent snobbishness in the reactions to the new job. The modern *coiffure* adopted by young girls also requires attention, for whilst the various curls may look very pretty, we are afraid that, once established, there is sometimes a tendency to allow them to "stay put" for several days. Factory conditions are such that the continuation of such practices will lead to trouble. With full knowledge, however, of the excellent work performed by British women in all spheres of activity, we are reasonably certain that once "teething" troubles have been overcome, this mighty reserve of female labour will successfully play its part in bringing about the final victory of British arms.

D

Safeguarding Copper Supplies

By "ONLOOKER."

Judging by reports reaching this side from America it would seem as if the copper situation is developing along lines similar to those which have been followed here since the beginning of the war, and although at the moment a licensing system has not actually been instituted, there are signs that the "priority" method at any rate may be adopted in the near future. The rapid expansion in the U.S. consumption of copper which has taken place is responsible for the action taken by the authorities in arranging for a large proportion of the South American output to be shipped to the States. Actually a large proportion may mean all, for Chile and Peru between them probably do not dispose of more than 350,000 long tons per annum, and it seems not unlikely that the equivalent of such a tonnage will be required by the United States in order to balance the copper situation on the domestic market. It now appears that under a new governmental ruling it will be obligatory on users of this metal in the United States to furnish every month particulars of the stock of copper held by them in order that the Metals Reserve Company, with all the facts in its possession, may be able to determine what quantity of the special tonnage imported ought to be employed for the purpose of bolstering up the stocks of any particular user. It may be true that statistics can be deceiving, but there is no doubt that in the absence of all essential facts, accurate judgment is impossible.

In this country from the word "go" we have operated on a scheme which had been carefully planned in advance to take care of just such a situation as the war has created, and with a full knowledge of all the facts the Controller of Non-ferrous Metals has been able (to employ a military metaphor) to deploy the metals at his disposal to the best possible advantage. From time to time, especially in the early months of the war, difficulties arose, but due largely to the excellent relations which existed between the authorities and consumers as a result of harmonious working, these were overcome, and the national effort maintained at maximum strength. Perhaps it is too much to claim that the Control has succeeded in roping in every possible factor bearing upon the employment of copper, lead and zinc, but it can be asserted with confidence that there are relatively few loose ends left over to cause trouble. Inevitably a fairly large volume of clerical work is involved in the preparation of the necessary returns on the basis of which the Control is able to reach its decisions and formulate its policy, but the machine appears to have run itself in and the system is working smoothly. So far a certain amount of copper has been released for purposes which might not be claimed as vital to the prosecution of the war, but a recent announcement by the President of the Board of Trade makes it clear that in the future this will be impossible.

It is perhaps on the old metal side that control is most difficult to exercise, for ramifications in scrap are many, and it is necessary to cover a very wide field if every risk of leakage is to be eliminated. There is, of course, a licensing system for scrap just as for virgin metal, and through the operation of this a check is kept upon the uses to which old metal of various kinds is put. Stock returns are rendered by holders of scrap metal, and one way and another a fairly comprehensive grip is kept on the movement of this important factor in our raw material supply programme. Nevertheless everyone realises the complexities of the scrap trade, and doubtless most people would be prepared to admit that if any leak is occurring in the system of non-ferrous metals control it is here that search should be made for it.

Some Jobbing Foundry Experiences—XXIII

By "TRAMP"

Fig. 1 is an interesting example of the jobbing founder's art and is the body of a pattern-maker's small hand-plane which can be made in either brass or iron. The special features which merit attention are the mould joint, the method of making the interior, and the system adopted to ensure the mouth running up sharp and true. To ensure the face being clean, this is cast "down." The pattern being of the shell variety, the bar A, Fig. 1, is let into the sides of the pattern loosely and tapered toward one side. The joint of the mould is shown in Fig. 2,

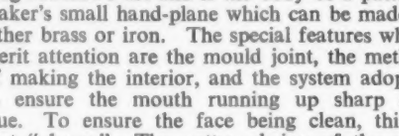
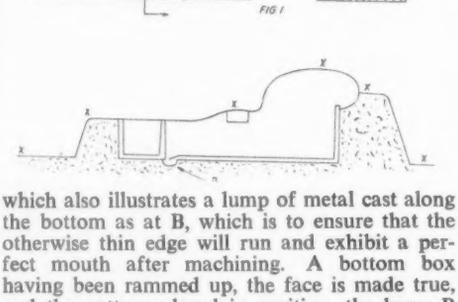


FIG 1



which also illustrates a lump of metal cast along the bottom as at B, which is to ensure that the otherwise thin edge will run and exhibit a perfect mouth after machining. A bottom box having been rammed up, the face is made true, and the pattern placed in position, the lump B being "bedded in." The outside is then built up, to join the joint along the line xxxxxx. The top is next rammed, well vented and lifted, loose piece A being included in the lift. This is then extracted in the direction of arrow Z. Thin runners being cut into the end, the job is ready for assembly and pouring with hot fluid metal.

Foundry Patent Action

Mr. Justice Bennett, in the Chancery Division of the High Court on Tuesday, dismissed an action brought against the Clay Cross Company, Limited, of Clay Cross, Derbyshire, in connection with a patent relating to improvements in the production of unhardened metallic castings in metal moulds.

Plaintiffs in the action were the owners of the patent, the International De Lavaud Manufacturing Corporation, Limited, of Toronto, Canada, and Cochranes (Middlesbrough) Foundry, Limited, of Middlesbrough, and the Stanton Ironworks Company, Limited, of Stanton-by-Dale, Nottingham, who were said to be exclusive licensees in this country for the manufacture and sale of castings made by the patented process, the feature of which was the lining of the mould with silicon or a compound of silicon and a metal.

It was alleged that the Clay Cross Company had infringed the patent, and that they supplied the Shipley Urban District Council with cast-iron pipes made in accordance with the invention. The Clay Cross Company, who denied infringement, challenged the validity of the patent.

The plaintiffs had claimed an injunction against the Clay Cross Company, but they only sought to recover damages in the action, it being stated that the patent expired shortly before the trial of the case began.

The hearing of the action lasted over a month, and counsel made their final speeches early in March, when Mr. Justice Bennett reserved his judgment.

Now giving his considered opinion, his Lordship said that in his view the action failed. Although he held that there had been infringement of the Clay Cross Company by the invention, he thought the patent was invalid because the specification did not give sufficient information as to how the promised result was obtained.

The action was dismissed, but the Judge made no order about costs.

Random Shots

"Marksman" is grateful to a member of the Clan Menzies who has sent the following limerick, which will give the uninitiated a better idea of the pronunciation of that difficult name:

There was a young lady called Menzies
Who said "Do you know what this thing is?"
Said her aunt, with a gasp,
"I'm afraid it's a wasp,
And you're holding the end where the sting is!"

* * *

Whilst a mere Sassenach is prepared to admit that "thing is," "sting is," and "Menzies" may rhyme perfectly, yet the rhyming of the two middle lines does not sound very convincing.

* * *

There are many speculations as to why Rudolph Hess has deserted his Führer and flown to England, and amongst these is the theory that as he has been suffering from ill-health for some time without finding a cure, he has come to this country in desperation in order to consult a good German doctor.

* * *

The many foundrymen who are members of the National Liberal Club will be sorry to hear that it was hit in a recent raid, but will at the same time be relieved to know that the damage has not interfered with the normal working of the club, although, at the moment, one has to get from here to there by many devious and unaccustomed routes. A tale is told of how David Low was in the club a day or two after the damage, and noticed with satisfaction that his original cartoons, which line one of the corridor walls, were still intact, not even suffering from broken glass. "Hm," he was heard to remark, "they used remarkable discrimination, didn't they?"

* * *

Whilst so many German parachutists are meeting with disaster in Crete, it is interesting to recall that it was in this island that Icarus, of Greek mythology, met with his fatal air accident. It was his father, Daedalus, who constructed the famous labyrinth for King Minos of Crete, who thereupon proceeded to imprison in it both father and son. Daedalus, being a great inventor, improvised a set of wings for himself and Icarus from feathers and wax, with which to make good their escape. Daedalus himself managed to reach Sicily, but Icarus flew too near to the sun, which melted the wax, and he fell into the sea and was drowned.

* * *

The following little story from Australia is likely to tickle the imagination as much as it tickled the person of Mrs. Kangaroo. Fishing a pair of twins out of her pouch, she boxed them both soundly on the ears. "Take that, Melbourne," she remonstrated, "and take that, Sydney," she went on. "You've both been eating biscuits in bed."

* * *

An enthusiastic metallurgist has written to "Marksman" a letter couched in the following terms:—

"What is the difference, from the inclusions point of view, between cold and hot blast irons, blast-furnace and refined irons, pig-iron and cast iron, pig-iron and steel? What becomes of the theory that some differences in cast irons are due to some of the silicon in ore being present as silica? We are now in a position to begin to answer these questions in the light not of speculation or theory, but of facts, and some surprising developments are likely to follow. Morrogh's Papers form a very creditable addition to the results of British research at this critical time, and will show our friends in the United States and cousins in the Dominions that the flag is still flying." So that's that!

"MARKSMAN."

Foundry Mechanisation and Equipment*

By J. McLURE RENWICK

A Paper was presented at the February meeting of the South African Branch of the Institute of British Foundrymen, Mr. Lion-Cachet presiding, by Mr. J. McLure Renwick on the subject of the mechanisation of foundries.

Foundry mechanisation is no new thing; it is the question of its suitability. To the ironfounder, as well as to any other industrialist, mechanisation is synonymous with economy. Any plant or equipment installed must be paid for out of the profits resulting and this in a reasonable length of time. It is often found, for instance, that two jobbing foundries doing exactly the same work operate under totally different conditions. In one foundry there is found a quantity of mechanical equipment and in the other none whatever. They are both producing and making profit, but which is making the more? The man with no equipment argues that he is able to sell as cheaply as the other fellow, one reason being that he has no equipment to write off and none to keep in repair. The other fellow, in his turn, states that his output is enhanced and that he can always obtain personnel (reference is made, of course, to normal times); or, he argues, his equipment reduces the manual effort. These are statements which have actually been made on many occasions.

The natural deduction is, therefore, that the question of mechanisation depends generally on the viewpoint of the management and if it is against the idea, no arguments will avail. Yet, if a crane is installed, surely this is one form of mechanisation; it is a means used to simplify work and to reduce labour costs and to permit of coping with heavier work.

The author recalled that he had not been in South Africa very long, but he had been there sufficiently long to appreciate the remark made to him by his father, who came here years ago, to the effect that native labour was not cheap. This same point had been borne out to him by others long resident in the country. The reason was clear. A boy is made to transport castings by hand or barrow, is made to prepare the ground for the hand-moulder, is made to fettle by hammer and chisel, etc. In transportation a lift of some 80 lbs. would, overseas, be considered a reasonable amount for ordinary and, more or less, continuous handling, but the boy must have an aid and the rhythm of the work is, as always, the speed of the slower. This is an aside, but the point should be brought out that having this native labour at one's disposal, and the fact that it is always available is, from a personal aspect, one reason why foundry development in the mechanised sense is, generally speaking, somewhat behind the times in South Africa.

Mould Drying

When a mould is all prepared, instead of drying it out from an open fire, it is common practice on the Continent to use a portable fan fixed to a coke fire. The air is driven around the coke fire, but does not come in contact with it, and is led through an outlet into one or more ducts—old zinc pipes sometimes—in such manner that the whole mould is evenly and properly dried. This further permits of drying during the day while the workmen are at work and is not messy or annoying in any way. The design is usually such that there is very little heat from radiation—therefore there is no inconvenience to the moulders working nearby.

Sandslingers

The question of the Sandslinger is often raised, and it has often been queried as to whether such a machine can be of daily use in a jobbing foundry. The author does not pretend to be in a position to answer this question, for the diversity of opinion he has encountered makes him feel it is again a question of management, size of work, available space and organisation.

For instance, there is the foundry where the Sandslinger was put into a fixed position and the boxes brought to and carried away from the Slinger by crane. The director stated he had hardly improved his output at all and blamed the machine. But it should be stated his crane was slow, his foundry very cramped and, particularly, his sand feed was not organised. In another foundry of the same type, the management arranged that the machine be fixed as in the former case, but each box was placed on a bogie, and better still all the knock-out sand was brought behind the machine. Between the heap sand and the machine a sand mill was interfixed and the sand discharged from the mill fell into the feed of the slinger and through the machine into the boxes. When the box was filled, it was pushed aside to permit of yet another box being slipped in, in front of the machine with its own particular pattern. The point here is that the organisation permitted the machine to work almost without interruption, and the output was all that could be desired.

From the foregoing remarks on the jobbing foundry it would appear that many difficulties are encountered with regard to mechanisation which are entirely due to space, foundry layout, sand, and in a great measure—organisation.

How often are men found standing idle for want of a crane which is being used in some other part of the shop! In many cases such inconvenience and loss of time could be saved by installing simple jib cranes. In one foundry there were jib cranes over and above the travelling crane—there were actually twenty in all installed in a foundry 200 ft. long—ten on each side, and whereas before they had only ordinary pulley blocks for raising and lowering the boxes, now electrified pulley blocks with two speeds have been installed in order to further expedite the work. This may seem to point to luxurious foundry practice, but this installation grew from one jib and an overhead crane, and the development and growth of this foundry was due to its well-chosen material and organisation.

Foundries overseas find themselves in highly competitive markets and if a foundry wants to exist it must keep abreast of progress. This fact forces the hand of the management to do everything possible to reduce the working time on each job by cutting out ramming, fettling and transportation time (incidentally reducing the fatigue factor of the moulder). There is material to meet all these requirements and to-day there are few jobbing foundries which have not made use of mechanical equipment in order to keep in the market.

The application of mechanisation varies very much according to the ideas of the management. In bath-making the Sandslinger is found, but the jolter is also found. The man who uses the jolter says he obtains a more even ramming; the man with the Sandslinger says he has no trouble in that direction; yet another neither jolts nor slings the sand, but has trained men, trained from their youth, using very effective and efficient tackle, and from this manual labour alone they obtain surprisingly high output. But one such manager stated that his men were becoming old and falling out and new men of experience were not forthcoming; the apprentices, who were expected to come forward, preferring to work at the petrol-filling pumps. His problem was, should he use a Sandslinger or a jolter? Who is to advise him? The onus of the decision would appear to rest with himself.

The problem of the jobbing foundry will always remain a problem. It seems to bear out the saying—"One man's meat is another man's poison." The question of mechanisation in the foundry where there is some degree of repetitive work is quite another matter, however, and for rapid production there must be moulding machines, transport arrangements, core blowers, and the like. The point to consider is just how much mechanisation will prove profitable, for personally, the author is a firm believer in reducing mechanisation to its simplest expression and having no more than is essential.

Mechanised Continuous Casting Plant

In the case of the continuous casting plant, the cycle of operations is as follows:—

The boxes are knocked out over a grid on the floor level through which the sand passes on to a belt conveyor. In some cases a magnetic separator is installed between the belt and the elevator. The question of the position of the magnetic separator will be entered into later. Assuming that the magnetic separator is at the end of the underground belt conveyor, there the tramp metal is removed and the sand is then taken up the elevator and discharged over a live riddle into a stock hopper. From this it is extracted by some means and discharged into the mill. From the mill the sand is lifted by a conveyor belt or elevator and fed on to an overhead conveyor which passes directly over the moulding machines. The sand is scraped from this conveyor into the individual hoppers which feed the respective machines. It has sometimes been considered an ideal arrangement to place a grid around the bases of the machines in order to remove the spill from the boxes during filling, and this spilt sand is collected on a common belt underground and led back to the mill to mix with other sand in process of treatment. Consider the various units, in the installation, one by one, and try and find out the merits or demerits of certain arrangements.

The Knock-out Grid

In the grey iron foundry it is found that the grid made of flat bars, spaced according to requirements, serves the purpose very well. When it is said "according to requirements." this means that if very light work is being done the spacing between the bars should vary from $\frac{1}{2}$ to $\frac{3}{4}$ in., for precautions have to be taken to prevent the casting from falling down the grid. Yet, on the other hand, since the sand has been very lightly burnt, it will tend to pile up and not fall too freely through the bars of $\frac{1}{2}$-in. spacing, even though the bars are of the fire-bar pattern having a tapered section. The boxes may contain heavier castings which nearly fill them, the sand is very burnt and drier; but in this case, it usually trickles through very easily between the bars and any lumps from such sand are easily crushed by foot and dispersed.

The sand which falls through the grid is usually collected in a hopper, rectangular or conical in shape. In the former case, the hopper seals the grid at its top edge and the bottom edge is sealed to the belt by means of adjustable felt or rubber seals. The conveyor belt in this case is of the cotton duck rubber-covered type, having a number of plies compatable with the width of the belt. The rubber should be of heat resisting quality, naturally, and its thickness should not exceed $\frac{1}{16}$ in.; or if it does, it should be very little over this dimension. It has been found in practice that thick rubber coatings, when they begin to perish, go very rapidly and actually the thinner coated belts wear for years in some cases.

Only the very best belting should be used and for foundries the belt should never be troughed. It is quite conceivable that when the belt is troughed, and this is the reason for it being so, it collects the sand in the middle of the belt.

* A paper presented at the February meeting of the South African Branch of the Institute of British Foundrymen.

Yet by so doing, the thickness of the sand prevents the magnetic field of the magnetic separator from penetrating and this apparatus becomes less efficient. But the main reason is that cool sand is required for moulding and if at the knock-out grid the sand is packed up, the steam is being locked in and the sand is kept hot.

It is granted that if the belt be troughed, narrower belts can be used but this is only an economy at the first installation and for renewals; the disadvantages are serious when in daily operation.

In the steelfoundry it is usual to make the knock-out grid of cast steel with 1½ to 2 in. square holes with ½ in. ribs for spacing. In many cases the sand cannot be knocked out from the boxes over the grids because of the hard lumps. In such cases, the sand is knocked out either on the floor or on to a belt and shovelled or fed into a disintegrator placed over the underground conveyor-belt hopper. The former method is employed at the knock-out in foundries making ingot moulds.

A conical hopper is used at the knock-out very often in small installations, and serves as a form of stock hopper. The sand is drawn from it by means of a rotary feed plate and fed on to the conveyor belt, as in the case of the rectangular hopper. This idea is to be deprecated, for the stock of sand carried does not usually exceed a ton in quantity. As the sand in use should not pass through the system more than two to three times per day, such a hopper would not carry sufficient stock to be of any use whatever, excepting in a very small foundry indeed—which could hardly be remunerative.

The knock-out conveyor belt was mentioned previously as being of duck, rubber-covered; but in many cases—such as in plant making heavy brake blocks, axle boxes, etc.—the sand reaches such a temperature that no rubber belt could stand up to it for very long. In such cases, therefore, the apron plate conveyor is fitted.

This consists of a series of steel plates each overlapping the other and made endless. There are various types, but one is as good as the other, provided the plates have flanged sides in order to retain the sand.

The magnetic separator now comes in its rotation. It is obvious that if an apron plate conveyor is used the magnetic separator cannot be placed in the position of the head drum, and would have to be placed in some other part of the system. There are two types of magnetic separators—the pulley type and the overband. There are partisans for both.

In one steel foundry the pulley type proved inefficient because core irons found their way between the belt and the magnetic pulley. This may be due to bad design, where the utility length of the magnetic pulley is wide in relation to the belt width.

The overband magnetic separator, as its name implies, is placed over the belt, and at right angles to the axis of the belt. The magnets are enclosed, and travelling around them, carried on three pulleys, is a belt driven by a ¼ h.p. motor. There are studs in the small belt which run down almost to the top surface of the conveyor belt. As the sand passes, these studs probe the sand, opening it up and thus helping in the removal of the tramp metal. The metal jumps to the magnets, but is carried along the small belt to be discharged clear of the conveyor belt.

With regard to the position of the magnetic separator. If this is placed in the pit under the knock-out grid, the refuse must fall into the pit and be collected from there. This is one disadvantage, and a second one is that when the sand is hot at the knock-out, it is good practice to add the new sand on the knock-out conveyor belt to help to cool the old sand. It has been found, therefore, that at this point, where there is a quantity of steam, the new sand with its richer clay content adheres to the tramp metal, and as the tramp metal goes to the refuse container, it often carries new sand with it and, apart from the loss, this may have bad repercussions on the sand sent to the machines. It is advisable, therefore, to place this unit between the elevator and the stock hopper. The sand from the buckets of the elevator is thrown on the belt and loosens the sand on the tramp metal, and furthermore the sand spread on the belt is better, being more even and regular and thinner in depth.

Elevators

The elevators in a steel or grey-iron foundry, as well as the buckets, should be of suitable design. The ordinary elevator used for coal, gravel, etc., permits the material discharged into the boot of the elevator to fall on the floor level, and the buckets pick up the sand by driving into the mass piled between them and the casing of the elevator. The bottom drum of the elevator, which should be the tension drum, should be so placed that the sand entering from the boot must fall straight into the buckets. The bucket speed, therefore, and the bucket capacity, must be so designed that as far as is practicably possible, no sand should fall on the floor.

Again, the buckets, when passing over the top drum and when leaving the vertical centre, should be so fixed that they must give a little kick to help to discharge the sand from them. It is realised, of course, how foundry sand does stick, and it is mostly so after leaving the knock-out.

During a recent discussion on elevators in London, one gentleman stated that, having a great deal of trouble with an elevator, he thought by lowering the bucket speed to obtain a better discharge from the buckets. He did, but the sand fell inside the elevator casing. He increased the bucket speed, but sand did not leave the buckets at all. Admittedly, his was a bad case, but foundry sand is not easy to deal with and, as usual, special cases need special treatment. Elevators should preferably have belts of cotton duck rubber-covered and not chain. Chain belts wear out quickly, stretch, are noisy, and if not enclosed, create dust, particularly at the knock-out. At this point it might be mentioned that an enclosed elevator acts as a chimney and helps to clear the knock-out of steam.

Actually, in plants where the sand is excessively hot, it has been impossible for the operators at this grid to work. In one place—fortunately a port town—the only men who could stick the job were stokers. However, the problem was solved by installing a small exhausting fan branched into the knock-out hopper and the top of the elevator. The men then, particularly in summer time, worked under ideal conditions.

The sand up to this point has had no chance whatever of liberating its steam. In some plants, instead of using an elevator to remove the sand from the knock-out grid, a large wide belt has been installed and the sand placed in such a position that the belt could be of considerable length, the idea being to try to cool the sand while travelling. A drop in temperature of 3 to 4 deg. C. has been registered, but this is very little; in fact, useless.

The common practice is to place a live riddle between the discharge from the elevator and the stock hopper. Often the elevator discharges on to a short length of conveyor belt, the head drum of which is actually the magnetic separator. The screen or riddle has mesh varying from ¾ in. to 1 in., according to the nature of the sand. Such foreign matters, as wood, etc., which have reached this stage are eliminated by the screen, and this refuse, as well as the tramp metal refuse, is led through separate down-take pipes to containers on the ground level in easily accessible, but discreet positions, which helps towards orderliness. The screen should have high frequency vibrations in order to send the sand through in rainlike fashion, breaking the sand up as fine as possible and liberating the steam.

In one foundry a spray of water was played on the sand discharged into the screen in order to help to cool it, but this was ineffective. The remedy was found by placing a disintegrator or aerator at the boot of the elevator and still using the screen at the elevator discharge—proving that opening the sand is the best way to liberate the steam and obtain the quickest cooling effect.

United States Manganese Ore Industry in 1940

Deliveries of manganese ore (35 per cent. or more manganese, natural) from domestic mines in the United States are estimated at 40,000 long tons in 1940, compared with 29,307 tons in 1939, according to the Bureau of Mines, United States Department of the Interior. Arkansas, Montana, and Tennessee accounted for about 80 per cent. of the total in 1940. There were no deliveries from Puerto Rico in 1939 and 1940. Deliveries of ferrruginous manganese ore (10 to 35 per cent. manganese, natural) from domestic mines are estimated at 306,000 long tons in 1940, compared with 239,544 tons in 1939, New Mexico and Minnesota contributing about 90 per cent. of the total in 1940. Deliveries of manganiferous iron ore (5 to 10 per cent. manganese, natural) from domestic mines are estimated at 984,000 long tons in 1940, compared with 469,703 tons in 1939, about 98 per cent. of the 1940 total coming from Minnesota.

Imports for consumption of manganese ore containing 35 per cent. or more manganese in 1940 consisted of 1,254,588 long tons of metallurgical ore containing 601,931 tons of manganese and 20,852 tons of battery-grade ore containing 11,704 tons of manganese. In 1939, imports for consumption of both grades were 627,131 tons, containing 313,811 tons of manganese. In addition, 38,883 tons of ore containing 11,074 tons of manganese (28 per cent. Mn) were imported for consumption in 1940, compared with 30,684 tons containing 8,452 tons of manganese (28 per cent. Mn) in 1939.

General imports of manganese ore containing 35 per cent. or more manganese in 1940 comprised 1,268,153 long tons of metallurgical ore containing 601,887 tons of manganese and 26,125 tons of battery-grade ore containing 14,045 tons of manganese. In 1939, general imports of both grades were 698,490 tons containing 341,816 tons of manganese. In addition, 38,883 tons of ore containing 11,074 tons of manganese (28 per cent. Mn) were received in 1940, compared with 30,684 tons containing 8,452 tons of manganese (28 per cent. Mn) in 1939. Arrivals of general imports originated from the following countries: Union of South Africa, 235,400 long tons; Brazil, 222,551 tons; Gold Coast, 217,927 tons; British India, 215,040; U.S.S.R., 179,237 tons; Cuba, 130,621 tons, and the Philippine Islands 43,515 tons.

Reduction in Nickel Content

Mr. J. E. Jackson, the managing director of the Copper, Iron and Steel Development Association of Cleveland, has been advising foundrymen to the effect that a high copper, high manganese cast iron can often be used in place of castings containing much nickel alloys. By so doing the nickel content can be reduced from 4.5 to 1.25 per cent.

Piecework and Production in the Foundry*

BY J. C. HALLAMORE.

Piecework covers a very wide range, and in these times, when production of the foundry is of vital importance, it plays a very important part in foundry output. In spite of this, it is very rarely the subject of a Paper and consequently never comes forward for discussion.† It is the Author's opinion that such a Paper would create a very lively discussion, and data of value to the trade as a whole might result. In these difficult times drastic changes cannot be brought into the trade, but the industry must be prepared for normal times in the future and look well ahead. Bad piecework rating quickly creates discontented workmen and a decrease in production soon results. For the purpose of this Paper, it is proposed that floor moulding only, in grey iron and malleable, should form the basis for discussion.

The first point to consider is price allocation and from what data available such prices can be ascertained. Assuming that a moulder should earn time and a quarter, the Author has tried, by comparison of various jobs, to arrive at some definite basis to secure such prices, but must admit that he has nothing tangible to put forward. The method of timing a moulder and settling the price accordingly can be recommended in some instances, but will not always be suitable.

The setting price naturally has a very large bearing on fixing of rates and two major points arise: (1) The buyer is not paying a fair price for the castings, or (2) the employer is not giving a fair piecework rate. In discussing the first point, much evidence is available to show that such is the case.

All foundries like the plain and heavy jobs with no cores and the buyer seems prepared to pay a good price per cwt. On the other hand, when the foundry is called upon to produce intricate cored castings, light in weight, the buyer expects such castings "dirt cheap." Foundries accept such jobs trusting that the heavier jobs will keep the balance right, thus a poor price results.

If this view be correct, it is up to the trade to insist on prices of castings being based on the amount of work in the job and not so much by weight.

If the managements allow such conditions to persist then they can be rightly designated the "mugs" of industry. It is only by a united effort that such demands can be secured and the trade itself must make that effort.

In the second instance, the type of employer cited is in the minority and the Author does not propose to dwell on this point. For examples to justify these views he puts forward the following jobs:—

The approximate time for moulding is three-quarters of an hour, the weight varying from 12 lbs. to 68 lbs. The least weight is a needle casting used in the agricultural trade and made in a 24-in. square box with five cores. The greatest weight is a valve made in a box 21 in. by 14 in. with one body core. The piecework rate for the heaviest weight is three times that of the lightest. It does not require much thought as to which moulder is the more satisfied, and which will work with the best will.

It must also be borne in mind that in a piecework rate, the moulder has many other jobs to do which are not direct moulding. These are well known; there is no need to quote them here. Much vital production time is lost here and better use of labour would do much to speed up matters, with a subsequent lowering of moulding cost.

Are all foundrymen satisfied in their own minds that production in their shops is at its fullest? The Author would suggest that such is not the case and that the industry as a whole could do much more. It is proposed to leave the subject at this point and hope that the points raised may form the nucleus of a good discussion.

* An entry for a competition organised by the East Midlands Branch of the Institute of British Foundrymen. Previous entries were published in the FOUNDRY TRADE JOURNAL for May 15 and 22.

† This topic, unless dealt with on purely academic lines, is prohibited by the Rules from discussion by the Institute.—EDITOR.

Patternshop Developments*

BY L. L. COX.

The author, in choosing the above subject, will endeavour to show the progress made in patternmaking during recent years. This no doubt has been accelerated by the demands of the motor-car and light-foundry trades, for large numbers of repetition castings. To meet this demand it has been necessary to make patterns and coreboxes capable of withstanding the increased wear and tear, and to achieve this result a large number of patterns are now made of metal, and fixed on plates for plate-moulding.

The metal patternmaker, who until recently was relegated to some obscure corner of the patternshop, or machine shop, now comes into the forefront, and to-day quite a number of wood patternmakers are experienced metal workers, and youths are apprenticed to this branch of the trade, through the increased use of metal patterns and plate work.

In the earlier days, the majority of castings were made of grey iron, in which a liberal section of metal was necessary to obtain the essential strength. With the development of a non-ferrous metal, $\frac{1}{4}$ to $\frac{3}{16}$ in. section is by no means uncommon. This necessitates a very high standard of accuracy in both patterns and coreboxes. It is almost a universal practice in these trades to use the first casting as a proof, to be cut into numerous sections thus revealing thicknesses, etc., very fine limits being allowed, to which patterns and coreboxes have to be corrected.

Frequently from a patternmaker's point of view his work is more complicated in devising methods to reduce work in the foundry, particularly in repetition work. Core assembly is a case in point, and the patternmaker may have a few headaches trying to visualise from the drawing, how one core will pass another, and there are no moulding joints to assist in assembling.

Model making is another branch of patternmaking mainly used for press blocks and dies, for pressing parts of motor-car bodies, etc. The wooden model, which is an exact replica of the required press block or die, is fixed on a duplicator machine together with a casting on which allowance has been made for machining.

New Plant Available

On the duplicator machine is a tracer, which passes over the model, and transmits the shape to the cutter machining the casting. It is most important that the model should be correct in every detail, as all defects will be reproduced.

Credit must, of course, be given to the engineers who have by their enterprise and ingenuity designed and improved machinery in this trade, which have enabled the patternmaker to keep up to date, so that he can produce more intricate patterns quicker, work to a finer degree of accuracy, and keep pace with the ever advancing foundry work in general.

It is a great step from the treadle lathe to the present modern wood turning lathe, with independent drive, and variable speeds which are obtained by the movement of a lever, while in the last few years a portable moisture-measuring instrument has been produced, for measuring the percentage of moisture in the wood.

With the installation of dust extraction plant, and better lighting systems, the working conditions have shown a marked improvement. In most patternshops piecework systems have been introduced. These vary considerably in the various shops. The modern pattern stores have cabinets, in which the details of each pattern can be traced at once, which is more satisfactory than leaving the store-keeper to memorise, or keep part records of his own.

Last, but by no means least in importance, is the increased co-operation between the patternshop and the foundry. There has no doubt been considerable improvement in this direction during recent years, and the author looks confidently to greater co-operation, which can only result in greater efficiency and mutual good-will to all concerned.

* An entry for a competition organised by the East Midlands Branch of the Institute of British Foundrymen. Previous entries were published in the FOUNDRY TRADE JOURNAL for Moy 15 and 22.

Chemical Composition and Fluidity of Slags

Discussing the relationship between the chemical composition and fluidity of blast-furnace slags, H. HELLBRUGGE and K. ENDELL point out in the "Archiv für das Eisenhüttenwesen" that the modern view of the chemical composition of blast-furnace and other metallurgical slags assumes that no stochiometric compounds are present or have ever been definitely established, but that the only substances present are the products of electrolytic dissociation. The viscosity of silicate melts is due to the amount of the cations present, the ionic radius and the valency of the cation, the valency of the cation in the anion complex, the number of points of separation of the SiO_4-tetrahedral lattice and the ratio of oxygen to silicon. Experiments show that the anions also affect the viscosity, for an equivalent exchange of metallic oxides, by fluorides and chlorides causes a marked reduction in viscosity. The authors prepared a number of experimental melts in which lime was replaced by magnesia; from the results obtained together with those of 68 viscosity measurements by McCaffery and collaborators on the system MgO-CaO-Al_2O_3-SiO_2, they show that the Endell-Brinkmann formula connecting the viscosity and the chemical composition for all ordinary blast-furnace slags may be used to predict the viscosity, at least within the range of viscosity coefficients of 0.5 to 2. They also suggest that the viscosity at 1,400 deg. can be approximately calculated directly from the sum $SiO_2 + Al_2O_3$ in percentages by weight. No satisfactory result was obtained with this formula in the case of open-hearth slags with viscosity coefficients between 4 and 10 as no silicate structure remained. Extensive dissociation of fluid silicate melts into cations and negatively-charged anion complexes affects the course of various metallurgical reactions, such as deoxidation, dephosphorisation and desulphurisation.

Notes from the Branches

East Anglian Section. At a meeting held on May 17 at the Central Library, Ipswich, over which Mr. G. Hall presided, Mr. C. H. Kain presented a Paper on the "Production of Steel Castings." It was announced that in future meetings would be held at the Crown and Anchor Hotel, Ipswich, the new meeting place to be used for the first time on June 4. A discussion on a number of subjects of topical interest has been arranged.

Low-Temperature Research

MAY LECTURE TO THE INSTITUTE OF METALS

The 31st annual May Lecture of the Institute of Metals was delivered yesterday (May 28) in the Clarendon Laboratory, Oxford, by Dr. F. Simon, F.R.S. (Reader in Thermodynamics in the University of Oxford) on "The Significance of Low-Temperature Research." In the chair was the President of the Institute of Metals, Lt.-Col. the Hon. R. M. Preston, D.S.O.

Before the Lecture, the President presented the Institute of Metals Medal to Dr. Cecil H. Desch, F.R.S., Past-President. This was the fourth award of the Institute's platinum medal, previous recipients being Sir William Bragg, F.R.S., Sir Harold Carpenter, F.R.S., and Dr. Paul D. Merica. Dr. Desch, trained as an organic chemist, became Graham Young Lecturer in Metallurgical Chemistry in the University of Glasgow, and subsequently Professor of Metallurgy in the Royal Technical College, Glasgow, and the University of Sheffield, and Superintendent of the Metallurgy Department of the National Physical Laboratory. Since his retirement he has been Adviser to the Iron and Steel Research Council. His text-book on "Metallography" is now in its fourth edition. Dr. Desch is a Past-President of the Institute of Metals and of the Faraday Society, and a Vice-President and Bessemer Medallist of the Iron and Steel Institute.

The May Lecture

After the President had introduced the lecturer, Dr. Simon delivered his lecture. He began by discussing how it comes about that temperature can influence properties of matter, and showed that at low temperatures one must expect phenomena connected with small energy changes. In pre-quantum theory times no such changes could be expected, and consequently the interest in lower temperatures was mostly restricted merely to a race downwards. This changed on the advent of quantum theory which showed that the vibrational quanta in condensed matter correspond to this region of temperature. The consequent drop of the specific heat towards 0° K is of profound influence on all properties of matter, particularly through its connection with the Third Law of Thermodynamics. This law and its implications for theory and problems of technology were then discussed, along with its corollary, the unattainability of absolute zero.

New Low Temperatures Reached

It was then shown how every phenomenon occurring in any particular temperature region can be used to reach this very region. Consequently the discovery of magnetic states of matter with very small energy differences between them led to a new method for reaching still lower temperatures than had been possible with gas liquefaction, to Debye-Giauque's magnetic method in fact. The type of information to be expected from investigations in this temperature region was discussed, and similarly for the still lower region which might be reached using the nuclear paramagnetism. There is a type of phenomenon characteristic of the lowest temperatures which can occur only there, *viz.*, that where the zero point energy is predominant, and in this connection the behaviour of liquid helium was mentioned. Finally, it appears that the low-temperature region can be used to obtain results of great practical interest from model experiments: it is possible in this way to investigate phenomena inaccessible to direct experiments at high temperatures because the requirements involved, *e.g.*, pressure or magnetic field, are then prohibitive.

The National Service Act, 1941

The National Service Act, 1941, not only amends certain provisions of the National Service Act, 1939, but introduces new provisions likewise. Thus, whereas under the Principal Act, which applies to men (18 to 40 inclusive), service meant in the Armed Forces, now a person can be called up for civil defence (*e.g.*, police, fire brigade, first aid, wardens, etc.); furthermore, this applies to conscientious objectors, that is, those registered only conditionally, as for example, taking up some stated occupation (not for police service, for these people).

A person, when called up, can state his preference for any civil defence force, which will be recorded in the Military Service Register, the same as preferences now entered (*e.g.*, Navy, Army, Air Force).

Service will be considered as under the Crown, but directly under the local authority concerned, and may be anywhere in the United Kingdom or the Isle of Man, and will mostly apply to the older men (*e.g.*, the thirties) or men in Grade 3, fit but who may not be physically fit militarily (*e.g.*, loss of trigger finger, etc.). Pay proposed is £3 10s., with clothing and other allowances, as for example, for wife and dependants, if serving away from home town, similarly subsistence allowances, for sickness periods and the like.

Amendment of the National Service (Armed Forces) Act

Amendments of the Principal Act have been made, an important one applying as regards failure to submit to medical examination. Hitherto a person who so refused could be fined £5, but if imprisonment was ordered, no period could be stated, so indefinite detention could only apply. Now, a Court can order a medical examination, and the person can be detained in custody (up to seven days) until the date appointed for the examination. Furthermore, failure to comply is an offence, and the penalty can be a fine of £50 or less (on indictment £100) or imprisonment up to twelve months (on indictment two years), or to both fine and imprisonment.

Postponement of Service

Postponement of service can be obtained by any individual called up, if a Military Service (Hardship) Committee is satisfied that exceptional hardship would follow calling up, and certificates are allowed under three heads:—(*a*) Domestic position; (*b*) business responsibilities and interests; and (*c*) individual circumstances and other cases, etc. Under (*a*) and (*c*) the hardship proved must be something different from that which may possibly appertain to everyone called from civil life, under (*a*) the circumstances of the dependants of the applicant to be considered, under (*c*) that of the applicant; under (*b*) it must be shown that time is required for making arrangements for the carrying on of the business (or arranging for disposal), and that these cannot be made immediately. Medical examination must be first undertaken, and application made within two days afterwards. No certificate can be given for more than six months at a time, although renewals can be granted (if under (*b*) only up to twelve months with renewals). For renewals previously, application was required to be made at least fourteen days before the end of the period granted. Now, by this new Act, unless the Ministry of Labour is satisfied that there are special circumstances, an application may be considered any time before an enlistment notice (Armed Forces) or enrolment notice (Civil Services) is served on the holder of the certificate.

(*Continued at foot of next column.*)

Reorganisation of the French Steel Industry

After the Compiegne armistice, complete reorganisation of the French industrial structure was undertaken in order to introduce a greater measure of State control over industrial activities, somewhat on the lines now associated with the corporate state. As such a transition would take time, a "law for the temporary control of industrial production" was promulgated on August 16 last, which gave the Government the power to control all industry, dissolve industrial associations which the State regards as inimical to its interests, and to constitute control committees on which the authorities and the employers would be represented, but not for the moment the employees. The powers enjoyed by these committees are very considerable, for they cover all industrial operations, the distribution of raw and other materials, the control of trade and competition, and the supervision of prices.

As already announced, this law led immediately to the dissolution of the Comité des Forges and the setting up of new organisations; this has since been followed by a third organisation, Comité d'Organisation de Fonderies embracing all iron and steel foundries. As the raw materials required by various industries are frequently common to a number, an Office Central de Repartition des Produits Industriels was set up on September 10 to control the general distribution of materials, a number of subsidiary committees dealing with specific industries. These committees can compel producers to sell to specified consumers, as well as consumers to buy from specified producers, thus removing all freedom of action.

The subsidiary distributing organisation for the iron and steel industry, Office de Repartition des Fontes, Fers et Aciers, was formed on October 17, being quite independent of the selling organisations which previously handled this trade. It controls all the principal raw materials for the iron and steel industry, such as iron and manganese ores, scrap, as well as pig-iron, spiegels and ferro-alloys, all kinds of steel, rolling mill products, pipes and all cast goods.

The disposal of finished products is handled by the new Comptoir Francais des Produits Sidèrurgiques, which has replaced the old Comptoir Sidèrurgique de France. The new body has a greater sphere of interest than the old comptoir, for it also embraces products which were previously under the control of subsidiary and independent comptoirs, or which were not covered by a comptoir at all. The new comptoir has an initial capital of 100,000 fr., and will undertake the sale of all iron and steel products, as well as by-products, on behalf of the shareholders or of persons not belonging to the organisation, as well as of members of sales organisations or groupements de vente en commun, apart from own account. The comptoir also has control over iron and steel-works and mines, and can lease or exploit these as thought fit. No quotas will in future be granted, this having been one of the main functions of the old comptoir.

(*Continued from previous column.*)

It might be useful to add that an employer can, in some circumstances, secure postponement of service of an employee (*e.g.*, temporary retention required because the employee is considered indispensable as being engaged on work of national importance). Application to be made to the relevant Government department (if on contracts), or the Board of Trade, or on the distributive side to the relevant divisional office of the Minister of Labour. This applies similarly to employers or the self-employed.

The Purification of Air and Gases

DUST, FUME, MIST, SMOKE AND FOG ELIMINATION WITH THE TRAUGHBER FILTER

The elimination of dust, fumes, smoke, fog and mist from the atmosphere, and the separation and collection of particles of solids and liquids in suspension in air and gas, are problems of paramount importance in many branches of industry, where almost every operation produces dust, fumes or mist. A large blast furnace, for instance, discharges over 2,000 lbs. of dust into the atmosphere every hour.

When a substance is divided into fine particles and dispersed into air or gas, important changes in its physical, chemical, mechanical and electrical properties result. These changes produce two main effects:—(1) The surface contact area with the surrounding medium is materially increased; and (2) the space occupied by the substance is many times greater than the volume of its original mass. For example, the surface area of a moderately large pea would be about 0.2 sq. in. That same pea, reduced to a very fine powder, would have a surface area of about 9,000 sq. in., that is, 45,000 times greater. This dust, dispersed into the air in moderate concentration, would occupy a space a million times greater than the volume of the original pea.

Since the chemical reactions of a substance, its solubility, evaporation and electrostatic activity are all functions of its surface area, reduction into a fine powder intensifies its chemical and physical activity. Some dusts will burn with explosive violence. Furthermore, the absorption of a film of the surrounding gas upon the surface of a particle has far-reaching effects upon many physical phenomena, such as wetting. It will, therefore, be obvious why dust, especially very fine dust, has a considerable effect upon human tissues, upon all manufacturing processes, and all other substances.

To separate particles from air or gases, air or gas filters are used. Two main types are in common use—dry filters and wet filters.

Dry Filters

In dry filters the air or gas to be cleaned is made to flow through a space in which obstacles are arranged in such a way that they will deflect the air and trap the particles in suspension, which, being heavier, have a greater momentum. The simplest type is a settling chamber into which the dust-laden air is led through pipes or flues. The chamber, having a much larger volume capacity than the pipes, reduces the speed at which the air passes through it, and this permits the heavier dust to sink gradually to the floor, while the air escapes through another pipe. The cyclone, in common use, is an improvement of this settling chamber, into which the dust-laden air enters the circular chamber from the side and travels rapidly downwards around the inner walls. The heavier particles are flung against the walls by centrifugal force and sink downwards, while the air escapes upwards through a central pipe.

In some dry filters the obstacles consist of baffles, against which the dust-laden air is made to impinge. These baffles may be coated with water or oil or some adhesive substance to prevent the particles which strike them being lifted off again by the rush of air. More elaborate filters of this type have self-oiling and self-cleaning baffles to reduce the loss of efficiency when they become covered with dry dust. In bag filters the obstacle is a cloth through which the air or gas is blown; the closer the meshes of this cloth, the smaller will be the particles retained by it. The most common form of this type of filter is the household vacuum cleaner. Ultimately the cloth gets choked up and has to be shaken out. Large industrial filters of this kind also have shaking mechanisms. In the electrostatic filters, the deflecting medium is an electrostatic field produced between electrodes charged at between 30,000 to 100,000 volts along which the dust-laden air is made to travel slowly.

Every dry filter, therefore, depends for its functioning upon the difference in momentum between the moving air or gas and the particles suspended in it. But by far the largest proportion of particles in suspension in air or gases are so small that their inertia is virtually nil and often less than the movement imparted by their own electrostatic charge. An illustration of this is obtained when a thin beam of light is allowed to penetrate a darkened room. Particles of dust, still large enough to be seen with the naked eye, are in constant movement and never settle, though the air may be perfectly still. If this air were perfectly free from dust, the ray of light would not be visible.

Wet Filters

The application of water, or other liquids, is the oldest method of dealing with dust. The success of the wet filter largely depends upon the degree to which the particles in suspension in the air or gas can be wetted. It is important, therefore, that the largest possible surface of liquid and the gas to be purified should come into intimate contact. Saturation of the air with moisture has an important effect, because the suspensions form nuclei upon which the moisture condenses, making them heavier.

Producing an efficient wet filter is not a simple problem. Any particles in suspension consist of materials which repel water. Furthermore, the smaller the particle, the greater is the amount of air or gas in which it is suspended, and adsorbed upon its surface. The quantity of gas thus adsorbed is also dependent upon the nature of the material; its electrical condition; the temperature and the pressure of the gas. Unless the liquid with which the particle is made to collide has a lower surface tension, relative to the particle, than the air or gas adsorbed, the particle will not be wetted. Even when a particle has been wetted the probability is that if the gas is not saturated, the moisture will evaporate off the surfaces of the particle before it has settled. The current of air or gas will pick it up again and carry it along. An interesting method of increasing the action of water on particles in suspension in a gas is that based on disintegration. A mixture of the gas and water is thrown with great violence against baffles by a large rotating member. The dust elimination is then considerably increased, but such machines are large and costly and require considerable power.

Traughber Froth-Flotation Filter

The Traughber filter is probably the most modern type of wet filter, for it combines all the advantages of both wet and dry filters with some new effects. The air or gas to be cleaned enters the filter at a velocity calculated to produce sudden expansion. The momentum of the larger particles precipitates them at once towards the bottom of the chamber. This sudden expansions slows up the velocity of the air and reduces its temperature. This filter has the great advantage, compared with dry filters, that hot gases can be treated in it. The use of hot gases is in fact desirable because they retain more moisture when saturated.

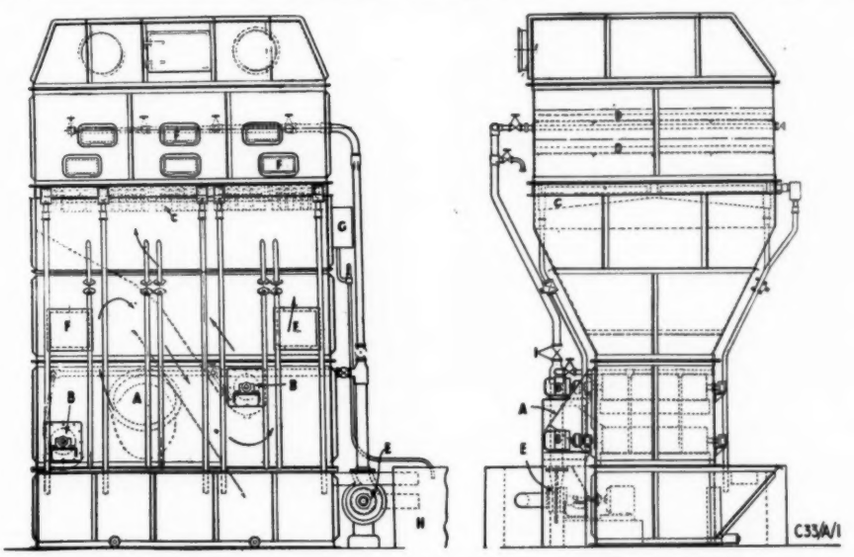


FIG. 1.—DIAGRAMMATIC LAYOUT OF A TYPICAL TRAUGHBER FILTER UNIT FOR HOT GASES OR AIR CARRYING A HEAVY BURDEN OF DUST.

In the Traughber filter, the intimate contact between large surfaces of gas and washing liquid is obtained by a simple yet effective method of atomisation of the liquid. A smooth-faced cylinder, rotating at a suitable speed in contact with the surface of a pool of liquid picks up a film of this liquid, and sprays it with considerable force in the form of a fine mist, sending it splashing with the gas to be cleaned, against the sides of the filter. In this filter, therefore, the momentum imparted to the droplets of liquid is relied upon to obtain the impact with the particles in suspension, and the disintegrating effect is obtained by sending both gas and liquid in intimate contact against the surfaces of the filter.

The character of the mist, the density of the droplets, their size and the volume of mist, can be regulated by choosing the right diameter of cylinder, and regulating its speed of rotation and the depth of immersion into the surface of the pool. On to this surface, from which the film of liquid is picked up, a minute quantity of a low-surface-tension liquid is allowed to drop at predetermined intervals. The result is that virtually every drop in the mist is covered with

an infinitesimal film of this low-surface-tension liquid, and very effective wetting action is obtained. In addition, the liquid acts as an evaporation retardant. As the spray and mist will reduce the temperature of the incoming gas, a reduction in its volume and consequently in its velocity is produced. Condensation on the particles in suspension is greatly accelerated. The low-surface-tension oil on the wetted particles insulates them electrically.

In all surface contact reactions the time element is an important factor. The Traughber filter, therefore, has two mist chambers, so arranged that, as the gas passes successively from one and through the other, becoming cooled down, the space occupied becomes larger, so that progressive reduction in velocity results. Suspensions which, although wetted, are still too small to settle, function as nuclei for further condensation of moisture, and they thus become heavier. The combination of slower speed and, therefore, greater difference of momentum between gas and suspensions helps the smallest particles to settle.

FIG. 2.—A 30,000-C.F.M. FILTER HANDLING HEAVILY DUSTLADEN AIR FROM TURNING, CUTTING AND BORING MACHINES MANUFACTURING GRINDING WHEELS.

The final and characteristic stage of purification is achieved by bubbling the gases in fine streams through a layer of water—the froth floor—upon which the low-surface-tension oil forms a froth as the gases blow through. This froth, the thickness of which can be easily regulated by adjusting overflows, through which it carries all the rest of suspensions and impurities into the sump of the filter, is the ideal equivalent of a filter cloth of constant, adjustable texture and resistance. Any froth entrained by the gas is arrested by low resistance labyrinth rings, which are constantly flushed with water, while a second layer of such rings retains most of the moisture in the gases.

Although covering so many functions, the Traughber filter is simple in construction and operation. It is self-clearing, and the only moving parts inside the filter are the spray rotors. These have practically no resistance to overcome, as they only just touch the surface of the liquid. The power required to operate them is only between 1 and 2 h.p. The fan and circulation pump is independent and outside the filter. The suspensions are collected in the form of a sludge, so that dust cannot be redispersed. In this form the collected dust or suspensions can be easily handled and treated by any suitable recovery process.

A valuable feature of this filter is also that the fan is placed behind the filter and operates in clean, cool air or gas. In this way the filter operates under minus pressure, which produces better distribution of the gases in the filter, and there can be no leakage outwards. Of course, it is possible to use this filter under pressure when necessary. Another feature is that the washing liquid used can, with suitable additions, be made to separate one gas from another, to neutralise acids, to bind or combine certain constituents, which can then be recovered. Moreover, the washing liquid is clarified and recirculated so that the consumption of water can, when necessary, be reduced to that quantity which is evaporated in reducing the temperature of the ingoing gas to the temperature of the washing liquid.

Fig. 1 shows a typical installation for dealing with hot gases or air carrying a heavy burden of dust. Shown on the diagram are (A) the *Air or Gas Receiver*, the lower portion of which forms a reservoir for the washing liquid, and the sump for the collected sludge. An overflow keeps the liquid level constant. The sludge may be discharged periodically or continuously by a conveyor arrangement. The gases are deflected towards the surface of the washing liquid, and project all the heavier particles of dust into the solution, leaving only the finer particles to be dealt with by the mist.

(B) *Spray rotors*, plain steel cylinders carried on ball bearings and rotating at about 1,200 r.p.m., just touching the surface of the liquid, and spraying a film of this out into a uniform dense fan. The gases travel upwards through the mist, and the wetting action of the special oil displaces the fine film of air surrounding the dust particles, which are carried down into the reservoir.

(C) The *froth floor* above the air receiver contains a layer of washing liquid, also covered by a film of the special oil. As the air or gases enter, they are deflected and carried below the surface of this liquid through serrated edges in finely divided streams. Bubbling upwards through the liquid an oil-froth is formed upon its surface, making a most effective filter. It traps the finest particles of dust and carries them through an adjustable overflow, which keeps the level of the froth constant, into the washing reservoir below.

(D) *Eliminators* which retain any moisture which might be entrained with the moving air or gases. (E) *A circulating pump* supplies fresh washing liquid from the reservoir in the receiver in just sufficient quantity to float off the impurities captured by the oil froth. (F) *Inspection doors*, airtight when closed, are provided in the lower as well as the upper chamber. (G) *An oil tank with adjustable sight feed* is located in a suitable position to feed the oil to the circulating system. (H) *Settling tank*.

Applications of Filter

The Traughber filter has now been in operation for several years in many installations all over the world. For the collection of foundry dust, many of these filters have been installed, ranging from capacities of 6,000 cub. ft. per min. to 48,000 cub. ft. per min. Other important installations include those for treating dust-laden atmospheres and gases in smelting and blast-furnace plants.

The filter has been constantly improved with experience. Standard Traughber filters are shown in Figs. 2 and 3. In this respect it may be interesting to realise that as the technical requirements of industry advance and progressively smaller particles in suspension are dealt with, the dividing line between a suspension and the gas itself becomes less distinct. This type of filter lends itself particularly to the treatment of problems for which up to now, so far as is known, no solution had been found. For instance, to the purification of gases in which one constituent is a true gas at certain temperature and becomes a suspension in a gas at another temperature, like tar fog in producer gas, or the fumes from certain metallurgical processes in which some of the metal vaporises at given temperatures into a gas and shows no tendency to flocculate and thus form a suspension until oxidised in air.

Both initial and maintenance costs are considerably lower than for any comparable plant. Less floor space is required, and special housing is unnecessary. The process can be used for treating hot or cold gases. It gives excellent results in the recovery of lead and zinc oxides from fumes, in the purification of producer gas, the elimination of dust from flue gases, the absorption of H_2S and SO_2, the recovery of CS_2, the recovery of silver and other valuable dusts. Traughber filters are used extensively in foundries, for collecting sand-blasting and polishing dusts; for cleaning air for drying and enamelling purposes, and for disinfecting and humidifying air for air conditioning. The filters are absolutely safe, and there is no risk of fire, such as exists with some types.

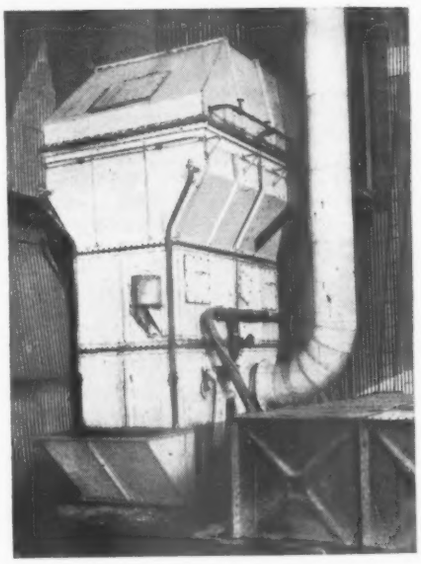


FIG. 3.—AN 8,000-C.F.M. UNIT AT A STEEL-FOUNDRY COLLECTING SAND AND DUST FROM HOPPERS, ELEVATORS AND GRINDING MACHINES IN A SAND MIXING AND GRADING PLANT.

Controlled Heat & Air, Limited, Smethwick, Birmingham, are sole licensees and manufacturers of Traughber filters in the British Isles.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

To the Editor of THE FOUNDRY TRADE JOURNAL.

Steel or Cast-Iron Pipes?

SIR,—We notice that some municipalities are still calling for supplies of steel pipes—in one recent case the demand was for 9 miles of 18 in. diameter material. Surely under the present circumstances it would be in the national interest that cast-iron pipes should be used.—Yours, etc.,

TUYERE.

"The Outline of Cupola Control"

In the discussion on the Paper of the above title, printed with the Paper in the JOURNAL of May 15, the author, C. A. Payne, was reported to have said, in reference to coke economy, that the "optimum coke-ratio could be determined in the coke office." This sentence should have read: "The optimum coke-ratio could *not* be determined in the *cost* office." This correction will dispose of any ambiguity attaching to the original erroneous report, and we sincerely regret this error should have occurred.

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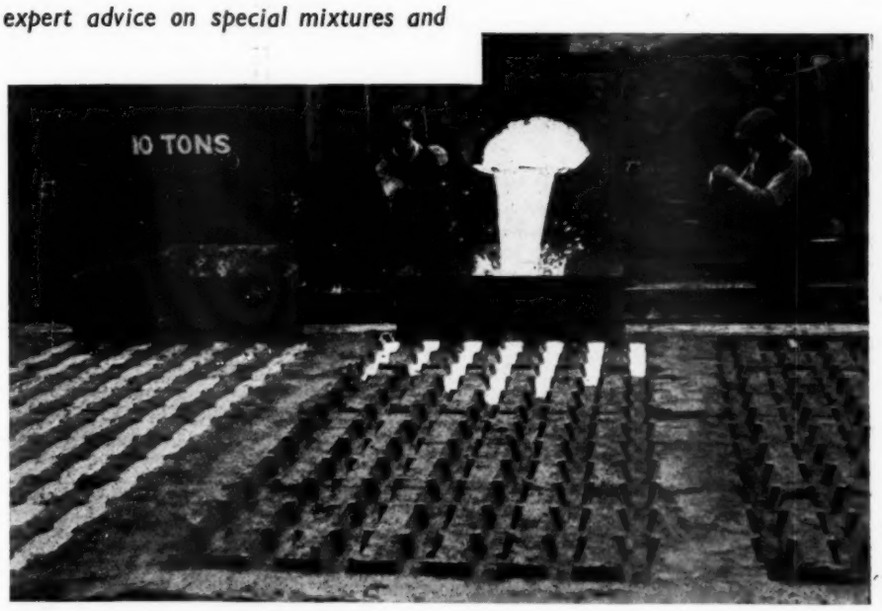

THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

The South African Engineering Industry at War

3—FIELD MORTARS

By A. G. THOMPSON, Editor of "Engineer and Foundryman"

The modern field mortar is an infinitely more effective weapon than the mortars which made their appearance during the last world war. Simple to operate, easily erected or dismantled, it can be fired with devastating speed and accuracy. The ammunition used consists of high explosive bombs which are capable of inflicting a considerable amount of damage. The bomb is slipped into the muzzle of the weapon, a detonating cartridge sets off charges which are fixed to the tail by means of a spring wire, and these send the bomb flying through the air for a mile or more. Once set on the target, a mortar can be operated with such rapidity that several bombs can be discharged before the first one finds its billet.

Heavy firing power combined with portability render field mortars a type of artillery which is specially suitable for African conditions, and the production of these weapons in considerable quantities constitutes an important and highly satisfactory section of the defence production of the Union.

The production of field mortars in South Africa may be said to have originated before the war, when a Johannesburg engineering company constructed an experimental mortar on its own initiative and with no outside assistance. The company made their own dies, carried out all forgings and castings on the premises, and even painted the completed mortar. So successful was the venture that construction of a further ten mortars was then undertaken. An order for a considerable quantity of field mortars being subsequently received, a workshop was specially equipped for their manufacture, and plans were made to undertake production on an increasing scale. As the scope of the national war effort increased, however, the assistance of other firms was made available, with the result that to-day the production and assembly of the various components are distributed among a number of concerns throughout the Union. The friendly co-operation and interchange of ideas which has made this decentralisation possible, is typical of the spirit with which the problems of munitions production have been approached.

A field mortar consists of three main assemblies, namely the base, the bipod and the barrel. The base is fabricated from a pressed steel plate and stampings of uniform thickness, expertly welded. The bipod consists essentially of a cast manganese bronze cradle, a forged body, a forged yoke, elevating and traversing screws; together with tubes for legs, leg spikes, hinges, stays, elevating tube, brackets, etc. The barrel comprises a body, breech piece, firing pin, recoil stop pin, and recoil stop spring band.

Early experiences with castings proved highly unsatisfactory, and rather than risk supplying castings of doubtful nature it was decided to make elaborate dies and resort to forging. Drop forging being more or less unknown in South Africa before the war outside the railway workshops, considerable difficulty was experienced in carrying out this section of the work. Latterly the South African Railways have taken on the production of all drop forgings for the mortars and are making a magnificent job of it. Thus one of the greatest problems has been solved.

* Previous articles on the war activities of the S.A. engineering industry appeared in the FOUNDRY TRADE JOURNAL of April 24 and March 13 last.

Castings for Field Mortars

Four parts for field mortars are being cast in high tensile manganese bronze, namely the cradle, stop recoil band, sight-supporting bracket, and cover. These parts are all intricate, and it is necessary in each case to put metal aggregating approximately four times the weight of the casting into the head in order to give the casting the requisite soundness. The cradle and the stop recoil band are both made in core form. After being hand-fettled and sand-blasted, the castings are inspected and are then dispatched to various engineering firms to be machined. All manganese bronze castings are carried out by a Rand firm, and are well up to strength requirements.

The imported material used originally for the barrels very soon became unobtainable. Now the South African steel industry has succeeded in producing a high tensile steel suitable for the purpose, which has proved satisfactory in all respects—a remarkable achievement in view of the short space of time within which the new material had to be made available.

The interior of the barrel is bored to tolerances of 1/3,000. As an indication of the standard of workmanship required, it may be added that the barrel is blind-ended and is 45 in. long.

The various components are inspected periodically in the course of manufacture and again on assembly. Finally the mortars are taken to range and proofed; that is to say, they are given a double charge of explosive and an overweight bomb, and are fired. They are then brought back to the shop, where the barrel is dismantled, cleaned, and thoroughly inspected and gauged. After being reassembled and painted, the weapons are ready to be dispatched to the army in wooden cases which are made componently to specifications by a building contractor.

A field mortar is actually one of the simplest weapons to produce, the accuracy required being for the most part less than that which is necessary in the case of—for example—a machine-gun. Nevertheless, certain components have an accuracy within very fine limits, which must be adhered to in order that the weapons may be thoroughly satisfactory in use. These limits are only obtainable by the full use of gauges and accurate machine tools. Now that this essential fact is fully realised, the production of field mortars may be said to be reaching a satisfactory standard of efficiency.

As an instance of the fine limits required, it may be mentioned that the standard clearance of an acme thread is 1/64, while the limit required in the elevating and traversing screws is 2/1,000. This limit, which used to make the hair rise on the average South African turner's head, is now regarded as all in the day's work.

The preparation of the drawings for field mortars was itself a considerable undertaking. Sketches had to be made for each and every operation on the entire job, some parts involving as many as a dozen or more operations. Each operator is supplied with a sketch referring to his particular operation only. This system leaves the operator free to concentrate on the particular section of the job with which he happens to be concerned. Thus time and unnecessary worry are avoided and manufacture and delivery are speeded up.

The Sights

Very special problems were presented in the design and manufacture of the sights, not only on account of the fine limits of accuracy required, but also because of the large number of small and intricate components; literally scores of difficult machining operations are involved in the production of each complete unit. In fact, several experts expressed the opinion that it would be impossible to manufacture articles of such complexity in the Union on mass production lines.

Nevertheless, 24 hrs. after the War Supplies Directorate had first approached them, a Transvaal concern specialising in high precision work undertook to produce these sights in the quantities required, and seven weeks later a sample unit was completed. This was a remarkable achievement, particularly since the absence of jigs necesssitated a special set-up for every operation. The sample unit proving satisfactory, a contract was duly awarded, and it then became necessary to design all the jigs and alter existing machinery to cope with the many machining operations required. It took weeks to design and fabricate the jigs, but eventually a completely satisfactory jigging system was evolved.

The next problem to be solved was that of organisation. In view of the large number of components, it was essential to organise production in such a way that the finished parts flowed together into the fitting room and the work of assembly could thus proceed without interruption or delay. Moreover, the fact that specially designed jigs had to be used for all major operations rendered it necessary for a very strict sequence to be observed in the case of every individual part.

Yet another difficulty was that of obtaining efficient men for the very intricate jobs involved. Even when men of the right class were taken on, it was only by experiment that the particular operation for which each man was most suited could be determined.

So successfully have these various problems been solved that not only are sights being produced in the quantities required, but the jigging system compares very favourably with systems used in factories overseas. Furthermore, the sights which are now being produced in the Transvaal actually contain various improvements which, it is believed, have not yet been adopted by munitions factories overseas.

Recently the writer had an opportunity of seeing how the dials and other complicated parts are made from rough castings at the establishment where all components of sights except the levels are produced. He saw readers being milled, delicate machining operations being carried out to a fitting accuracy of plus or minus nothing, and complete units being assembled. Admiring the perfection of a finished unit, he found it hard to believe that the production of articles of such complexity could have been originated in a South African factory, as it were, almost overnight.

New Wire Saw

Although it will probably continue to be called a wire saw, the name has become a misnomer as the result of recent changes in the medium by which certain stones, such as slate and marble, are quarried. The familiar type of saw is a 3-strand steel wire, $\frac{3}{16}$ in. or $\frac{1}{4}$ in. in dia., that travels over pulleys like an endless belt. Where it comes in contact with the rock and forms a groove it is fed with water and grains of sand, which are the teeth of the saw. In its latest form, described by the U.S. Bureau of Mines, it is made of a ribbon-like strip of hard steel twisted in order to increase the sand-carrying capacity and, as it becomes worn, to retain the abrasive particles. Every 25 ft. the twist is reversed to insure straight sawing. It is claimed that operations can be greatly speeded up with the new saw—in fact, that it cuts marble nearly twice as fast as does wire, or at about half the cost.

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Metallography of Cast Iron

DISCUSSION ON NOTABLE CONTRIBUTIONS

At the Annual Meeting of the Iron and Steel Institute, held in London recently, MR. H. MORROGH presented two Papers on the metallography of cast iron, (*a*) "The Polishing of Cast Iron Micro-Specimens and the Metallography of Graphite Flakes," and (*b*) "The Metallography of Inclusions in Cast Irons and Pig-irons." These were discussed jointly and some extracts are appended.

DR. J. E. HURST said that, so far as cast iron metallurgy was concerned, the author had established a scientific method of studying the question of inclusions. He (the speaker) had only one remark of a critical nature to make, and it concerned the conclusion in the Paper on the polishing of cast-iron micro-specimens, where it was stated that specimens could be prepared in 15 min. Although the method of preparation of the specimens was set out in very great detail, he would find it impossible to prepare a specimen himself and get the results which the author had obtained in such a short space of time.

MR. T. HENRY TURNER said that the author's method of polishing had its limitations, and it was pointed out in the penultimate paragraph of Part I of the Paper on polishing cast-iron micro-specimens that phosphoric irons did not react to it so well as hematite irons. That was unfortunate, because in the particular work with which he (the speaker) was concerned the phosphorus always ran up to the 1 per cent. range, and it stood up proudly when polishing was done by the method used by the author. It was probably correct to say that the author recommended a hard pressure working slowly, whereas ordinarily at Doncaster they used a soft pressure working quickly. That might be too concise a summary of the difference, but it roughly represented it; and with the high phosphoric irons, after trying the author's method, they still thought that it suited them best to use the high-speed method. With regard to the speed, it would be useful if, when the Paper was printed in its final form, the author would give the speed in feet per second rather than revolutions per minute, because when wheels could be of different sizes, the latter did not convey very much. The author's work must certainly be continued.

MR. J. G. PEARCE said that, so far as inclusions were concerned, it was now known what inclusions pig-iron and cast iron contained, although microscopic evidence could give no quantitative estimate. The author had not dealt with alloying elements other than those arising from zirconium and aluminium, which it was desirable, for the reasons which the author pointed out, to treat along with those of titanium. Titanium inclusions were now regarded as perfectly normal; but, with reference to what had been said by Mr. Turner, it should be mentioned that the work on the inclusions arising from alloying elements was being continued.

Application of Heat Tinting

MR. VERNON HARBORD said the point that he wished to make was in no way a criticism of the Papers, but was a suggestion which might enable the author to carry his very valuable work a stage further. He might be thought to be going back to prehistoric methods, but he thought that, in view of the improved technique in polishing, the old method developed by Stead of heat tinting might possibly give very valuable information about the complex constituents in cast iron which were in question. He did not say that entirely without evidence. A few years ago he was interested in certain constituents of cast iron, and he went to a very great deal of trouble in polishing specimens, rather on the lines outlined in the Paper; and he found that when heat tinted they were capable of examination under the highest power of the microscope without the general blurring effect which was obtained in the old days of ordinary polishing, and which definitely prescribed a limit to Stead's very valuable work in those days, when it was not found possible to examine any heat-tinted specimen much over a power of 100 diameters magnification. He did not know whether anything had been done on those lines, but certainly a properly polished specimen was capable of examination under high power when heat tinted, and it might be worth the author's while to consider that method as a further means of throwing light on a subject on which he had already thrown so much.

MR. A. ALLISON said there were three directions in which the author's work was particularly striking: the preparation of the specimens, the examination, and the verification of the constituents—because, after all, there were people who liked one to verify what one saw under the microscope and to show that the things one said were there really were there. The improved technique developed by the author had enabled far better records to be prepared than had ever been made before, and all that had been said about it was fully justified. There was one small criticism which he would like to make. On page 16 of the second Paper an analysis was given which gave the figure of 0.30 per cent. for manganese and 0.145 per cent. for sulphur. The corresponding micrograph was Fig. 31, and there it was suggested that fine and coarse pearlite was shown. He wondered whether the author had made sufficient allowance for the plane of angle of section of the pearlite, because it would appear that Figs. 28 and 29 had variable grains of pearlite, although it must be admitted that Figs. 32 to 34 appeared to substantiate the author's contention.

DR. T. SWINDEN associated himself with previous speakers in congratulating the author on a classical piece of work, and expressed his interest in two points which had already been made, the first being the possible uses of anodic etching, of which there had already been some experience in the case of steel, and the second that made by Mr. Pearce, that, having developed this technique, the author could not be allowed to stop until he had revealed the inclusions at present sub-microscopic.

The PRESIDENT (Mr. John Craig) congratulated the author on, while still a young man, presenting Papers of such importance. He was glad to think, he added, that young men were coming into the industry who early in life were offering such serious contributions to the solution of great problems.

He would ask the author to reply to the discussion in writing.

Rating Alloys for Die Castings

According to one of the largest producers in the United States, no single die-casting alloy or type of alloy rates above all others on all scores, according to the consensus of die casters who use the metals and are familiar with the problems involved with each, reports "Steel." If any alloy did, the users believe there would be no reason for using the others at all unless some scarcity of its ingredients made it unavailable in the quantities required.

Since this is true, the designer, in selecting the alloy to be used, should first list those properties which it must possess and those conditions which it must meet and then consider which of the alloys affords the best balance of advantages under these heads. In so doing, Table I is exceedingly helpful for it rates each of the commonly used types of alloys in order of preference under each of 21 heads.

These heads include not only mechanical properties and physical constants but, what is often more important from certain standpoints, the relative casting properties and the cost of the dies and of the casting itself. In all cases, the numeral 1 indicates the highest rating, and the numeral 4 the lowest, unless otherwise indicated. Where ratings are the same, there is under this heading no ground for choosing one alloy over another, as is shown by reference to Table I.

It is significant that, although zinc alloys do not rate highest under any of the mechanical and physical properties listed, they rank first in extent of use. The reason for this is that they rate highest in casting characteristics and lowest in cost per casting and in die cost. In general, zinc alloys are second only to brasses in mechanical properties. As, however, the brass die-casting ranks highest in cost, it is lowest in extent of use, showing how commercial considerations often offset high rating under mechanical and physical properties.

TABLE I.—*Comparative Ratings of Die Casting Alloys from Specific Standpoints.*

	Selection factor.	Aluminium alloys.	Brass.	Magnesium alloys.	Zinc alloys.
Mechanical properties	Tensile strength	3	1 (strongest)	3	2
	Impact strength	3	1 (toughest)	3	2
	Elongation	4	1 (most ductile)	3	2
	Dimensional stability	2	1 (most stable)	3	3*
	Resistance to cold flow	2	1 (most resistant)	2	3
	Brinell hardness	3	1 (hardest)	3	2
Physical constants	Electrical conductivity	1 (highest)	2	3	2
	Thermal conductivity	1 (highest)	2	4	3
	Melting point	2	1 (highest)	2	3
	Weight, per cub. in.	2	4	1 (lighest)	3
Casting characteristics	Ease, speed of casting	2	3	2	1 (easiest)
	Maximum feasible size	1 (largest feasible)	2	1 (largest feasible)	1 (largest feasible)
	Complexity of shape	1 (greatest possible)	2	1 (greatest possible)	1 (greatest possible)
	Dimensional accuracy	2	3	2	1 (most accurate)
	Minimum section thickness	2	3	2	1 (thinnest)
	Surface smoothness	2	3	2	1 (smoothest)
Cost	Die cost†	2	3	2	1 (lowest)
	Production cost	2	3	2	1 (lowest)
	Machining cost	2	3	1 (lowest)	1 (lowest)
	Finishing cost‡	3	2	3	1 (lowest)
	Cost per piece§	2	3	2	1 (lowest)
Extent of use at present		2	4	3	1 (most used)

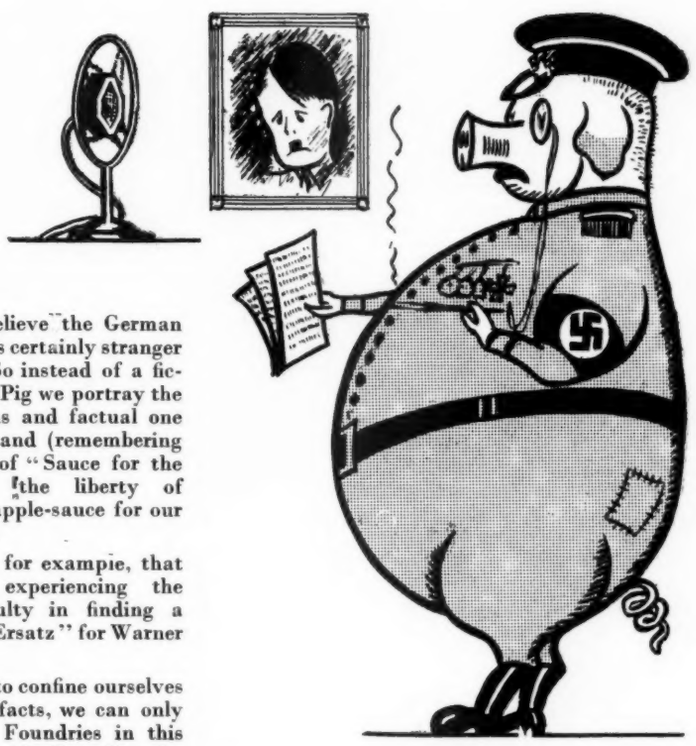
* Through the use of a low-temperature annealing treatment, A.S.T.M. Alloy No. 23 can be made virtually stable in dimensions.

† Dies for casting the low-melting point alloys are least expensive and have longest life.

‡ Includes polishing and buffing expense as well as ease of applying all types of commercial finishes, both electro-deposited and organic.

§ Based on die, material and fuel costs, production speed and machining and finishing costs.

"Jairmany Calling ...."



If we are to believe the German wireless, truth is certainly stranger than fiction. So instead of a fictitious Warner Pig we portray the *really* humorous and factual one from Bremen, and (remembering the old adage of "Sauce for the Goose") take the liberty of borrowing his apple-sauce for our impropaganda.

We might say, for exampie, that Germany is experiencing the greatest difficulty in finding a satisfactory "Ersatz" for Warner Pig Iron.

But, if we are to confine ourselves to established facts, we can only tell you that Foundries in this country are specifically calling for Warner Pig Iron, and that, knowing the destination of many of their products, we are supplying it to our usual standard, but with more than our usual satisfaction.

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The Week's News in Brief

Trade Talk

THE ANNUAL PRODUCTION of sodium has been computed by Dr. Colin G. Fink to exceed 300,000 tons a year.

AT 184,178 TONS, the 1940 U.S. production of virgin aluminium exceeded the 1939 output by 26 per cent. The current figure is to be more than doubled by 1942.

THE MINISTRY OF LABOUR and National Security announces that at May 1 the official cost of living index figure was 100 points above the level of July, 1914, compared with 98 points at April 1.

MR. A. HARES, the honorary secretary of the Bristol Section of the Wales and Monmouth Branch of the Institute of British Foundrymen is now residing at 167, Ridgeway Road, Fishponds, Bristol.

THE DIRECTORS of Keith Blackman, Limited, engineers, have placed privately 50,000 £1 5½ per cent. cumulative preference shares. This brings the amount of preference capital in issue up to the authorised total of £200,000.

A MEETING OF THE LONDON LOCAL SECTION of the Institute of Metals is to be held at the Junior Institution of Engineers (Incorporated), 39, Victoria Street, Westminster, S.W.1, on June 19, at 6.30 p.m., when Mr. F. A. Fox, M.Sc., will deliver an address on "The Production and Properties of Magnesium Alloys."

THE MANCHESTER SECTION of the Institution of Production Engineers and the Manchester Association of Engineers held a joint meeting at the College of Technology, Manchester, on May 26, when Mr. Mark H. Taylor, of Taylor, Taylor & Hobson, Limited, Leicester, presented a Paper entitled "Some Applications of Optics in Engineering."

FOUR 50-TON electric steel melting furnaces were installed in 1940 in the works of the Republic Steel Corporation. Two more of this capacity are now being added, which when in operation will bring the company's capacity up to 500,000 tons per year. The electric steel industry is indeed making great strides in the U.S., as one builder reports the sale of 71 furnaces in 1940.

THE DIRECTORS OF PLATT BROS. & COMPANY (HOLDINGS), LIMITED, ironfounders and textile machinery makers, state that, owing to ill-health, Mr. Henry Wilkinson has resigned from the board, and place on record their appreciation of, and thanks for his valuable services during his 51 years' association with the company. In his place they have co-opted Mr. F. R. W. Preston.

THE BOARD OF TRADE announce that the open general licence permitting the importation of "antimony ores, concentrates and residues; antimony, crude and semi-manufactured," from the British Empire, Palestine and Transjordan, French Equatorial Africa, French Cameroons, French Possessions in India, French Possessions in the Pacific, Belgian Congo and Ruand-Urundi has been revoked as from May 19, 1941. Separate licences will not, however, be required for goods which are proved to the satisfaction of the Commissioners of Customs and Excise to have been despatched to the United Kingdom before May 19, 1941, and are imported into this country before July 19, 1941. Forms of application may be obtained from the Import Licensing Department or from the offices of collectors of H.M. Customs and Excise. Applications should be addressed to the Import Licensing Department, Board of Trade, 1-6, Tavistock Square, London, W.C.1.

ACCORDING TO A STATEMENT issued by the Ministry of Labour and National Service, the number of men and boys registered as wholly unemployed at April 21 was 157,239, a decrease of 15,421 compared with March 17. Those registered as on short time or otherwise temporarily suspended from work on the understanding that they were shortly to return to their former employment numbered 41,795. Mr. Tomlinson, Parliamentary Secretary to the Ministry of Labour, replying to a question in the House of Commons last week, said that, allowing for those who were unfit for ordinary industrial employment, those temporarily out of work and about to resume it, and those changing over from one employment to another, there was now practically no reserve of unemployed labour available for, but unable to obtain, employment. All workers who were suitable for employment and who were available to be moved away from home could be placed in employment without delay. Under any system there must always be a relatively small number of persons who on any particular day were out of work between two jobs.

LORD MCGOWAN, chairman of Imperial Chemical Industries, Limited, in a statement circulated with the annual report and accounts, says that, while he fully believes in maximum taxation as a vital necessity in the present war economy and has never been among those who have cavilled at an E.P.T. rate of 100 per cent., yet he foresees difficulties and disadvantages in the continuance of such a rate. The most important of these—and the concession just announced does not afford any relief—arises in that the taxpayer is obliged to hand over the whole of his excess profits in cash while such profits are certain to be locked up to a great extent in increased stocks at higher price levels and in the larger book debts which of necessity accompany expansion of business. Stringency in supply of liquid capital thus occasioned, apart from its detrimental effect on the smooth running of any kind of business, might well have a serious consequence in the hindrance of natural and possibly nationally beneficial development. Again, this rate of 100 per cent. does not enable the taxpayer to provide adequate depreciation on capital expended in the national interest on purely wartime projects. The Finance Acts contain provisions designed to meet this difficulty, but they do not entirely remove the risk of capital loss. In Lord McGowan's view, every taxpayer should be entitled to a lien on his own excess profits to the full extent necessary to write off capital so expended—much of it at the direct request of the Government—and he expresses the hope that at the proper time it will be found possible for industry to be given this safeguard.

Personal

MR. S. J. FENTON, Birmingham manager of Brandeis, Goldschmidt & Company, Limited, metal merchants, has completed 50 years' association with the company.

MR. ALBERT ELLIS, managing director of Peglers, Limited, brassfounders, of Doncaster, and Mr. A. E. Emberton, a director of the company, have been appointed magistrates for the West Riding area.

MR. JAMES PRATT, manager of the pipe foundry at the Bradford works of E. & W. H. Haley, Limited, has received a presentation from the directors on completing 50 years' service. Mr. Pratt began with the firm at the age of 13.

DR. JOSEPH WARD, chairman of Thos. W. Ward, Sheffield, has been told by his medical advisers to take a complete rest, and has cancelled all appointments. Dr. Joseph Ward joined the business 63 years ago as office boy and ten years later became partner with his brother, the late Mr. Thos. W. Ward, the founder.

Wills

MARSLAND, A. S., director and secretary of William Turner & Brother, Limited, engineers and brassfounders, Sheffield	£1,817

Obituary

MR. CHARLES SHARP, who has died at Parkstone at the age of 80, was for 40 years a director of the British Oxygen Company, Limited.

MR. CLARENCE CASS, of Radcliffe, Lancs, who died last week at the age of 74, had been connected with the engineering industry all his life. He was associated with his brother in the firm of F. R. Cass, Limited, engineers, Britannia Foundry, Bury, until his retirement a few years ago.

WE VERY SINCERELY REGRET to announce the death of Lord Austin, which took place at his home at Lickey Grange, near Bromsgrove, at the age of 74. From an apprentice in Langlands Foundry in Melbourne, Australia, he rose to be one of the largest motor car manufacturers in the world, his works near Birmingham normally employing 18,000 to 20,000 people. He was born at Wentworth near Rotherham and received his early education at the local grammar school, but early in life migrated to Australia to receive his engineering training. His apprenticeship over, his two interests were sheep-shearing machines and mechanically-propelled vehicles. Thus as early as 1895, his first Wolseley motor car took to the road. His well-known opposition to the horse power tax was a factor in his commercial success, for it caused him to design the "baby" Austin. He never lost his interest in foundry work and took a personal interest in the mechanisation of the manufacture of castings. Having received the major honours which the motor car industry has to offer, he felt that he could devote some time to the promotion of the technical interests of the foundry industry. In 1937, he was elected an honorary member of the Institute of British Foundrymen and the President of the British Cast Iron Research Association. Unfortunately, his duties connected with the creation of the shadow factories, coupled with declining health precluded much of the personal activities which he had planned in connection with foundry technology development. Through his staff, however, much help of a vital character has been given. In 1936 he gave £250,000 to the University of Cambridge for research work. His son was killed in action in 1915 and there is no heir to the peerage.

Company Meeting

Stewarts and Lloyds, Limited

MR. A. C. MACDIARMID, presiding at the annual meeting of Stewarts and Lloyds, Limited, said it would be appreciated that it was not possible for him to make the usual detailed review of the company's activities. He could, however, give the assurance that their whole energies and effort were concentrated both at home and in the Dominions on work of importance in connection with the war. At the same time it was evident from the accounts submitted that the company's affairs were in a sound condition. Referring to the acceptance by Sir Walter Benton Jones, Bt., chairman of the United Steel Companies, Limited, of an invitation to join their board, Mr. Macdiarmid said that at the same time he accepted an invitation to join the board of United Steel Companies, Limited. These appointments were of a personal character, and were an indication of the friendly relations that existed between the two companies.

Reports and Dividends

Anti-Attrition Metal Company, Limited—No interim dividend (3¼ per cent.).

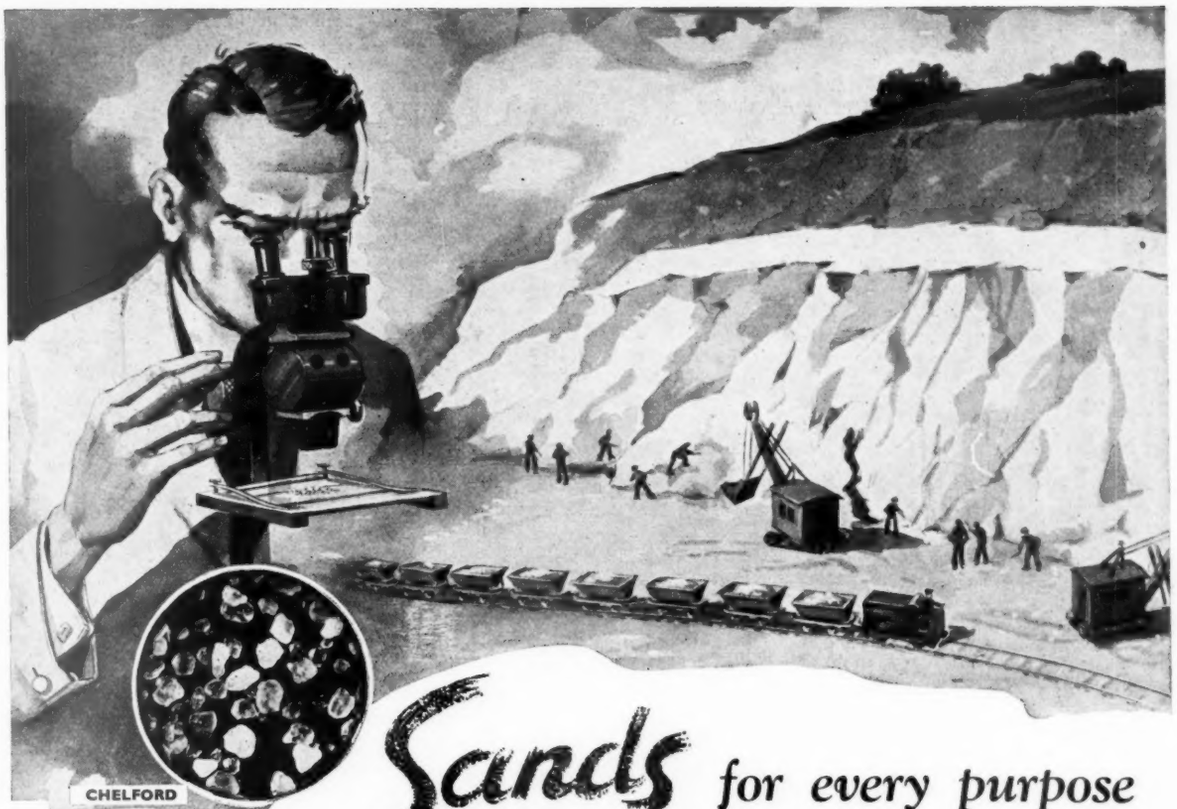
British Bedaux, Limited—Final dividend of 6 per cent., making 8 per cent. (same).

Jury Holloware (Stevens), Limited—Dividend of 10 per cent. for the year ended March 31, as against 7 per cent.

Platt Bros. & Company (Holdings), Limited—Net profit for the year to March 31 last, including £1,949 (against £10,558) withdrawn from debt reserve, £88,588 (against £108,025 for 1939-40); ordinary dividend of 5 per cent. (same); transferred to reserve, £20,000; carried forward, £26,515 (against £29,280).

Babcock & Wilcox, Limited—Trading profit for 1940, after depreciation, £789,338; income from investments and other sources, £95,691; total revenue, £885,029 (compared with £992,424); net profit, £717,347 (£756,663); provision for taxation, £451,058 (£448,644); distribution on the ordinary capital totalling 11 per cent., less tax; carried forward, £105,282.

Iron Trades Employers' Insurance Association, Limited—Premium income (less re-insurances) for 1940, £2,347,270; dividends, interest and rents, £96,678; surplus for the year, after meeting claims, commissions, expenses of management, etc., £915,328; brought in, £34,147; premium return fund, £785,000; reserve, £50,000; investments reserve, £50,000; staff fund, £12,000; hospitals donation fund, £3,000; written off furniture and equipment, £3,143; written off leasehold premises, £8,000; carried forward, £38,332. The directors recommend that a return of 35 per cent. of the workmen's compensation premium paid for 1940 be made.



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ACID-PROOF REFRACTORIES: *Obsidianite, Losol.*

INSULATION: *Amberlite* Bricks, Cement and Concrete.
SILICA BRICKS: *Lowood, Meltham, Allen, Quartex.*
CEMENTS: *Sintex, Durax, Pyrolyte.* PLASTICS: *Durax, Rotaline, Plastic K-N., Glendoline, Ground Ganister, Steel Moulders' Compositions.* SILLIMANITE: Tank Blocks, Bricks and Cements. SANDS: Moulding, Brick Facing, Silica, Glass.

Raw Material Markets

Pig-iron for the light foundries is in ample supply, but consumption is much below the normal level owing to the falling off of business in the light-castings trade, which relies to a large extent on orders from the building industry. No decline may be expected in the high rate of operations among heavy engineering foundries, as these establishments are practically fully engaged on Government orders, which tend to expand rather than contract.

Pig-Iron

MIDDLESBROUGH—Output of ironworks in this district is maintained, most of the production finding its way into steel plants here and also in Sheffield and the Midlands. So intense is the demand for steel-making iron that the manufacture of foundry iron has, to all intents and purposes, dried up; thus, local consumers have been compelled to seek their requirements in the Midlands, makers there being able to despatch adequate tonnages to meet the restricted demands of users. Purchase licences are freely given out, and it has been possible for some buyers to take up supplies in excess of their current requirements. The hematite situation remains tight, and non-essential users have little opportunity to acquire supplies, as the demand for urgent purposes is more than equal to production and, in fact, entails the consumption of a certain amount of imported material, of which the Control authorities have stocks for distribution in really urgent cases.

LANCASHIRE—Only moderate tonnages of pig-iron are needed by light-castings and jobbing foundries, the scope of activity in these sections having been restricted by wartime contingencies, and especially by the slackening off of specifications from the building trade. Speciality engineers continue to be well placed, due to their ability to cope with Government contracts, and consumption of iron by these concerns is at a high level. Special refined pig-irons are being utilised more freely in view of the difficulty in securing supplies of hematite.

MIDLANDS—Full-scale operations are still not possible in the light-castings trade, and it is fairly certain that works in this section will remain poorly situated for business unless ways and means are found to employ them on orders of national importance, as prospects in the building trade are anything but promising at the present time. High-phosphorus iron for the manufacture of light castings is forthcoming in sufficient tonnages to satisfy all demands. The Government is exerting heavy pressure on local makers of large castings, and works are assured of a market for all they can produce over a long period. Heavy engineering, machine-tool and jobbing foundries are all affected by the requirements of the war machine, and their consumption of low-phosphorus iron and hematite is at peak levels. Home output is incapable of looking after all demands, so that recourse has still to be had to the Control's foreign purchases, while the opportunity is taken where practicable of revising furnace mixtures in order to reduce consumption of low-phosphorus and hematite qualities.

SCOTLAND—The supply of pig-iron to the heavy engineering works is sufficient to keep users supplied with their immediate needs. Interruption of production is thus avoided, though consumers cannot, in the circumstances, lay down stocks. In view of the substantial amount of work on hand, reserve supplies of iron would be useful, and it is hoped that deliveries will improve. High-phosphorus iron for the light-castings trade is coming from makers in the Midlands of England quite regularly, and the flow of deliveries is more than sufficient to meet requirements. Rather slack conditions continue to prevail in the Falkirk and district light-castings industry.

Coke

Foundry coke is meeting with a steady demand on current account, while additional supplies are being taken up for stocking purposes. Durham best foundry fuel is quoted at 45s. 6d. per ton at the ovens, the price being officially controlled.

Steel

A feature of the steel trade of late has been an improved call for joists, channels and other structural descriptions, and mills producing these sections have better order-books than for some time past. Structural engineers are generally able to secure their requirements without delay. Makers of plates are fully employed on urgent contracts. Strenuous efforts are being made to enlarge the output of special steels, which are wanted in increasing tonnages for the production of munitions, armaments, etc., and it is anticipated that steady progress will be made in this direction.

Scrap

Since the war began, appreciable tonnages of iron and steel scrap have been imported, especially from the United States. But the Control are naturally keen that further purchases of foreign scrap shall be curtailed to the minimum, and if this is to be accomplished, collection of home-produced metal will have to be speeded up still further, as needs are very heavy. If the existing methods of bringing out old metal are tedious and unable to meet the situation, the authorities may have to adopt more drastic measures.

Metals

TIN—The Board of Trade has informed the London Metal Exchange of a general curtailment of licences for the export of tin from the United Kingdom to the United States, which will in all probability be continued for some considerable time. The Board added that as soon as the situation permitted exports on a more reasonable scale, permission would be gladly granted. It will be recalled that in April last the Board of Trade announced that no licences would be issued in respect of shipments of tin to the U.S.A. during May. It is believed that extension of the ban has been decided upon because of anxiety in official circles to increase still further the United Kingdom tin holdings. If urgent representations are made from any country asking for supplies of tin, consideration may be given, but only if it can be clearly shown that the tin is required for purposes directly connected with the British war effort. The announcement by the Board of Trade was followed by a decline in spot tin and an advance in the forward quotation, which resulted in the disappearance of the backwardation and the return to the more normal position of a premium on three months metal. Trading has been rather quiet of late.

It is understood that the Bolivian Ministry of National Economy is planning the erection of a tin smelter near the city of Oruro and that the Banco Minero has decided to contribute 600,000 bolivianos towards the costs of construction. The Bolivian mining industry is stated to be giving every encouragement to the venture.

Referring to the agreement between certain Bolivian producers and the American Metals Reserve Company, which contemplates construction, in the U.S.A., of a smelter or smelters for treatment of Bolivian ores, the Hon. Mr. J. D. Mead, presiding over the annual meeting of Petaling Tin, Limited, said that, from details recently published, it did not appear that the Bolivian Government had any intention of defaulting on its obligations under the tin control scheme; there was, however, no doubt about the threat to Straits tin, and as long as the new smelters continued in production, they must expect a decreased American demand for their metal. They must not imagine that the smelters would take long to build and equip, since an important national project of this nature would no doubt receive all the benefits of present-day high-speed production methods, with unlimited resources of labour and material. Tin, however, by reason of its imperishable nature and restricted occurrence, could be considered a good long-term investment and, having regard to its industrial importance, he personally believed that purchases on behalf of the U.S.A. were likely to continue for some time to come and, looking further ahead, it would appear that a heavy demand would be made on the canning industry by the necessity for supplementing Europe's own food supplies after the war. Nevertheless, the stocks of tin metal at present being accumulated must result in hard times in the mining industry, said Mr. Head.

Tin prices on the London Metal Exchange during the past week have been as follow:—

Cash—Wednesday, £266 10s. to £266 15s.; Thursday, £266 5s. to £266 10s.; Friday, £266 to £266 5s.; Monday, £264 5s. to £264 15s.; Tuesday, £262 10s. to £262 15s.; Wednesday, £261 10s. to £262.

Three Months—Wednesday, £266 5s. to £266 15s.; Thursday, £266 15s. to £266; Friday, £266 5s. to £266 10s.; Monday, £265 5s. to £265 15s.; Tuesday, £264 10s. to £264 15s.; Wednesday, £263 17s. 6d. to £264.

COPPER—Although no statistics are available for publication, it may be said with confidence that consumption of copper in connection with Government contracts is still increasing, thus leaving still smaller tonnages to be distributed among non-essential users, who have not been getting their full demands met for a long time past. In the United States, too, defence projects are accounting for the bulk of the output. Domestic production of copper must be at peak levels, while very substantial supplies of Latin-American metal will be utilised by U.S. factories operating on important contracts during the next few months. It has recently been suggested by Mr. W. Finch, a former director of the U.S. Bureau of Mines, that the domestic copper quotation should be increased by 5 cents a lb. as a means of raising output.

SPELTER—A big reduction in the rate of operations in the galvanising industry in the United States provides yet another indication of the measures of economy introduced in that country. The industry was recently employed at 85 per cent. of capacity, but the latest information is that operations have fallen to around 62 per cent. It was announced at the recent annual meeting of the American Metal Company, Limited, that the company's production of slab zinc was at the highest possible rate, and that its smelter output had been doubled during the past eighteen months. Non-essential consumers in the United Kingdom are not able to acquire a very big proportion of their needs owing to the Control's desire to ensure a free flow of metal into the war factories.

LEAD—Supplies of lead continue to be sufficient for all purposes, despite the fact that all Empire outputs are not destined for the United Kingdom, the United States having imported from Australia 5,039 short tons of pig-lead in March, in addition to 2,749 tons of lead in ore and matte during the same month. American imports of Australian lead in the first quarter of the year totalled 6,720 tons, against 2,800 tons in the corresponding quarter of 1940.

Patent Specifications Accepted

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The numbers given are those under which the Specifications will be printed and abridged, and all subsequent proceedings will be taken.

531,593 NEVYJEL, H., and RAMSCHEGG, F. Manufacture of profile metal sections from strip or rod material.

531,599 WILLIAMS, W. P. (Armco International Corporation). Process and apparatus for securing accurately butted ends for welding thin sheet or strip metal.

531,636 SCHLOEMANN AKT.-GES. Vertical stands for rolling-mills.

531,685 CURRAN BROS., LIMITED, and CURRAN, J. Metal pickling.

531,791 OYSTER, E. F. Method of and apparatus for forming sand into a mould.

531,832 BAILEY, R. W., BURTON, H. H., WINDER, G. B., METROPOLITAN-VICKERS ELECTRICAL COMPANY, LIMITED, and ENGLISH STEEL CORPORATION, LIMITED. Manufacture of metal castings.

531,944 BENOIT, F. P. C. Apparatus for projecting molten metal and metal alloys.

531,979 MESSER & COMPANY, GES. Device for the automatic adjustment of the height of the blowpipe of oxy-acetylene cutting-machines.

531,980 METALLGES, AKT.-GES. Process for the cold working of non-rusting steels.